

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 921 064 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
12.09.2001 Bulletin 2001/37

(51) Int Cl.7: B63C 11/08

(21) Application number: 98121298.8

(22) Date of filing: 09.11.1998

(54) Buoyancy compensator for scuba divers

Tauchauftriebskompensator für Taucher

Compensateur de flottabilité pour plongeurs

<div>(84) Designated Contracting States: DE FR GB</div> <div>(30) Priority: 03.12.1997 IT GE970101</div> <div>(43) Date of publication of application: 09.06.1999 Bulletin 1999/23</div> <div>(73) Proprietor: HTM SPORT S.p.A. 16035 Rapallo (Genova) (IT)</div> <div>(72) Inventors:<ul style="list-style-type: none">Garofalo, Giovanni16035 Rapallo (Genova) (IT)</div>	<div><ul style="list-style-type: none">Belloni, Alberto16036 Recco (Genova) (IT)</div> <div>(74) Representative: Porsla, Attilio, Dr. et al c/o Succ. Ing. Fischetti & Weber Via Caffaro 3/2 16124 Genova (IT)</div> <div>(56) References cited:<div>DE-U- 9 312 321FR-A- 2 623 465</div><div>US-A- 4 000 534US-A- 4 289 163</div></div>
---	--

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 921 064 B1

1

EP 0 921 064 B1

2

Description

[0001] The present invention refers to a balancing jacket for scuba divers as defined in the preamble of claim 1.

[0002] Balancing jackets for scuba divers have the purpose of enabling stable positioning of the diver at the desired depth. This is obtained by regulating the air contained inside the bag. In fact, if the diver wants to remain stable at a certain depth, he discharges some of the air from the jacket by operating a discharge valve until the desired amount of fluid remains inside the bag. Generally this valve is located in the top part of the balancing jacket, and thus enables discharge of air only when the diver is in a vertical position with his head at a lower depth than his feet. This therefore constitutes a limitation; in fact, if the diver has his head lower than his legs, as for instance, in the case where he is carrying out speleology, the valve can no longer discharge the air because it is in the part of the balancing jacket that is at the greater depth, and consequently in the part where there is no air since the jacket is generally not completely inflated.

[0003] Furthermore, balancing jackets are known which are provided with two valves for discharging air, located at the top of the jacket. However, these valves must be operated individually, and this, in the case, for example, of fast ascent, is not always convenient.

[0004] From FR 2 623 465 a balancing jacket is known provided with two valves for discharging air, located on the dorsal part of the jacket, one at the top and the second one at the bottom of the jacket. However, only one of the said valves can be remotely operated by the diver, by acting on a suitable chord.

[0005] Consequently, the main aim of the present invention is to provide a system of pneumatic opening of valves for discharging air which carries out opening of all the discharge valves of the jacket by operating a single control element. This is achieved by the technical features of claim 1.

[0006] In the specific case where the two discharge valves are both located in just one part of the balancing jacket, the advantage is obtained of a faster discharge of the air from the jacket.

[0007] Instead, in the case where the balancing jacket contains one (or more) discharge valves located in the top part and one or more discharge valves located in the bottom part, all connected to the air-discharge system, when the single discharge control is operated, which is generally a push-button, the user is sure that at least one valve will discharge, whatever his position may be. At the same time he must be also sure that through the valve or valves that cannot discharge air, water may not get in through them.

[0008] To overcome this problem, according to the invention the air-discharge valves are combined with one way valves, so that if any air is present, it goes out, whereas water cannot get inside in any case.

[0009] The invention will now be described in greater detail, with reference to the figures attached, where:

- Figure 1 shows a balancing jacket according to the invention;
- Figure 2 presents a side, partially cross-sectional, view of a valve according to the invention.

[0010] Figure 1 illustrates a balancing jacket 1 containing four valves 2-5 for discharging the air present in the jacket. The valves are connected to a pneumatically-controlled pipe 6. The pipe may be either internal or external to the balancing jacket and connects all the valves in such a way that when the diver operates the discharge button, it delivers compressed air, simultaneously opening all the valves for discharge. When no more air is delivered, the valves close. In this embodiment, four valves are present, even though operation is guaranteed even when only two valves are present, for example valve 2 and valve 4. In fact, it is sufficient for there to be present just one bottom valve and one top valve to guarantee discharge of air when the diver is in a vertical position, whether head downwards or head upwards. The presence of the four valves makes it possible to accelerate discharge of the air: since the valves operate in pairs, they discharge a double amount of air flow. In addition, the presence of the four valves enables regulation even when the diver is in an oblique position.

[0011] Figure 2 illustrates one of the valves 2-5. Unless that the balancing jacket is not completely inflated, a circumstance which is extremely rare, there is no air in the part of the bag that is at the greater depth. Consequently, when the valves open for discharging air, water, which is not impeded by the flow of air coming out, can come in through the valves located in that part. To get round this problem, the valves according to the invention are made up of one open-close pneumatic part and one one way part.

[0012] When the diver operates the push-button (not illustrated) for discharging the air, compressed air is sent through the pneumatic opening control 7, and the element 8 of the valve rises, so allowing the air present inside to exit from the balancing jacket 1. The air enters the chamber 9 and pushes the diaphragm 10 in the direction of the arrow A. The pressure exerted by the air is greater than the pressure of the water moving in the direction of the arrow B, and consequently the flow of air is directed outwards. When the pneumatic control 7 ceases to send out compressed air, under the action of the spring 12 the element 8 closes the valve again.

[0013] If no air is present at the valve, the pneumatic control lifts the element 8 in any case, but the diaphragm 10 does not move because there is not sufficient pressure inside the chamber 9 to withstand the external pressure of the water. In this way, the water is prevented from entering the balancing jacket.

[0014] Obviously, even though a balancing jacket provided with four discharge valves set in pairs at the top

and at the bottom of the jacket is illustrated and described, it remains understood that the invention equally comprises a balancing jacket provided with only two valves, both set in the same part of the jacket (top and/or bottom).

Claims

- 1. Balancing jacket for scuba divers, comprising at least two valves for discharge of air, at least one of said valves being located in the bottom part of the balancing jacket and at least one in the top part of said jacket, **characterized by** the fact that all the said valves are connected to a pneumatic-control pipe (6).
- 2. Balancing jacket according to Claims 1 **characterised in that** the air-discharge valves are air valves of the open-close type with return operated by an elastic element and are combined with non-return valves.
- 3. Balancing jacket according to Claims 1 and 2, **characterised in that** the said air-discharge valves consist of a shutter element (8) which lifts up from its seat, counteracting an elastic element, when compressed air is delivered by a pneumatically operated control (7) and by a diaphragm (10) which lifts up from its seat only if the pressure inside a chamber (9) is higher than the external pressure.
- 4. Balancing jacket according to one of the previous claims, **characterised in that** the pipe (6) that connects the series of valves may be either inside or outside the balancing jacket.
- 5. Balancing jacket according to one of Claims 1 to 4, in which the number of the air-discharge valves present is preferably four, two at the bottom and two at the top of the jacket.

Patentansprüche

- 1. Gleichgewichtsherstellungsjacke für Taucher mit mindestens zwei Ventilen zum Ablassen von Luft, wobei mindestens eines der Ventile in dem Bodenteil der Gleichgewichtsherstellungsjacke und mindestens eines im oberen Teil der Jacke angeordnet sind, **dadurch gekennzeichnet, daß** alle die Ventile mit einem pneumatischen Steuerrohr (6) verbunden sind.
- 2. Gleichgewichtsherstellungsjacke nach Anspruch 1, **dadurch gekennzeichnet, daß** die Luftauslaßventile Luftventile der Art offen - geschlossen sind mit Rückströmen, welche durch ein elastisches Ele-

mentfunktionieren, und alle mit Rückschlagventilen kombiniert sind.

- 3. Gleichgewichtsherstellungsjacke nach Anspruch 1 und 2, **dadurch gekennzeichnet, daß** die Luftauslaßventile aus einem Verschlußklappenelement (8) bestehen, welches sich von seinem Sitz unter Gegenwirken eines elastischen Elementes hochhebt, wenn komprimierte Luft durch eine pneumatisch betriebene Steuerung (7) zugeliefert wird, und aus einer Membran, die sich nur von ihrem Sitz abhebt, wenn der Druck innerhalb einer Kammer (9) größer ist als der Außendruck.
- 4. Gleichgewichtsherstellungsjacke nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Rohr (6), welches die Reihe von Ventilen verbindet, entweder innerhalb oder außerhalb der Gleichgewichtsherstellungsjacke angeordnet sein kann.
- 5. Gleichgewichtsherstellungsjacke nach einem der Ansprüche 1 bis 4, wobei die Anzahl der vorhandenen Luftauslaßventile vorzugsweise vier ist, zwei am Boden und zwei an der Oberseite der Jacke.

Revendications

- 1. Veste d'équilibrage pour des hommes grenouilles, comportant au moins deux vannes pour la décharge d'air, au moins l'une des vannes étant située dans la partie inférieure de la veste d'équilibrage et au moins l'une dans la partie supérieure de la veste, **caractérisée par** le fait que toutes les vannes sont reliées à un tuyau (6) de commande pneumatique.
- 2. Veste d'équilibrage suivant la revendication 1, **caractérisée en ce que** les vannes de décharge d'air sont des vannes à air de type ouvert-fermé dont le retour est actionné par un élément élastique et sont combinées avec des clapets de non-retour.
- 3. Veste d'équilibrage suivant la revendication 1 et 2, **caractérisée en ce que** les vannes à décharge d'air sont constituées d'un élément (8) formant obturateur qui se soulève de son siège, agissant à l'encontre d'un élément élastique, lorsque de l'air comprimé est fourni par une commande (7) actionnée de manière pneumatique et par une membrane (10) qui se soulève de son siège uniquement si la pression à l'intérieur d'une chambre (9) est supérieure à la pression extérieure.
- 4. Veste d'équilibrage suivant l'une des revendications précédentes, **caractérisée en ce que** le tuyau (6) qui relie les séries de vannes peut être soit à l'intérieur soit à l'extérieur de la veste d'équilibrage.

5

EP 0 921 064 B1

6

5. Veste d'équilibrage suivant l'une des revendications 1 à 4, dans laquelle le nombre de vannes de décharge d'air présentes est de préférence quatre, deux en partie inférieure et deux en partie supérieure de la veste.

5

10

15

20

25

30

35

40

45

50

55

4

EP 0 921 064 B1

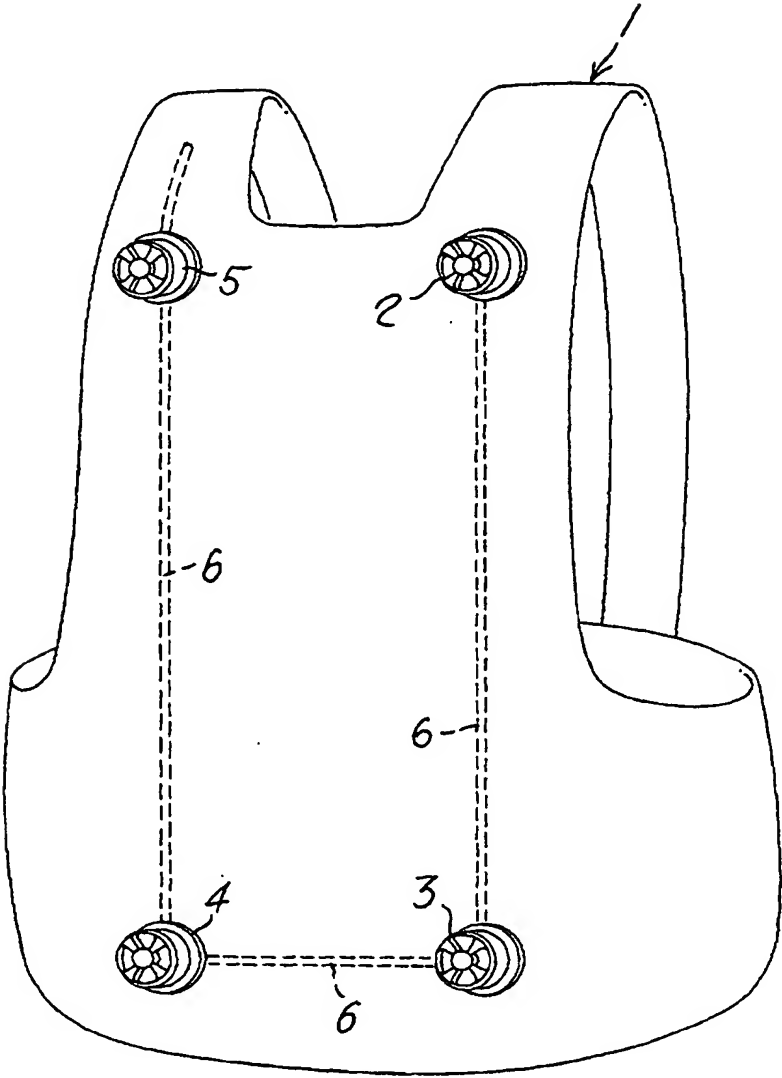


Fig. 1

Fig. 2